Activity Title: Groundfish Survey
Subject (Focus/Topic): Modeling how groundfish research is conducted on board.
Grade Level: 5th and 6th grade
Average Learning Time: 3 one hour classes
Lesson Summary (Overview/Purpose):

Day 1: Students will work in groups to classify fish species and record their lengths.
Day 2: Students will make graphs of their results and compare their findings.
Day 3: Students will explore online maps to understand variations in habitat.

Overall Concept (Big Idea/Essential Question):

How do scientists gather information about populations of fish?
Will you find the same species in all parts of the Gulf?

Specific Concepts (Key Concepts):

Species can be classified based on physical characteristics.
Measurements need to be taken carefully and accurately
Graphs are a visual representation of data
Species abundance will vary between sampling sites
Different factors in the habitat at the sampling site will impact species abundance

Focus Questions (Specific Questions):

What physical features can you use to differentiate between similar species?
Which station has the most total individuals? The least?
Which station has the most shrimp? The least?
Which stations have the most red snapper? The biggest red snapper?
Which sampling sites are in the deepest waters?
Which sampling site is in an area of low oxygen?

Objectives/Learning Goals:

Students will be able to sort photos of fish by species.
Students will be able to accurately measure the length of fish to the nearest millimeter.
Students will be able to make a bar graph of the fish species in one station.
Students will be able to compare results from different stations using the graphs.
Students will be able to use online and/or paper maps to gather information about habitat qualities.

Background Information:

The groundfish survey is part of SEAMAP – South East Area Monitoring and Assessment Program – a joint venture between NOAA and the states to better understand the populations of fish and shellfish along the coast of the Gulf and Atlantic. The information we collected on *Oregon II* is combined with the data from other ships that do surveys in closer to land. The groundfish surveys began in

the 1950s and happen each summer and fall. All this data tells a story of each species – how many individuals there are, how big they are, and where they prefer to live. This information can then be used to better manage the fishing industry so that fish populations stay strong. Scientists gather data about every fish species they pull up in the nets, but pay special attention to the ones that are fished commercially like shrimp and red snapper.

Common Misconceptions/Preconceptions:
Students may have difficulty measuring to the nearest millimeter. You may need to review basic measuring procedures such as lining up the fish at the zero line, not the end of the ruler and how to deal with a fish that is longer than the ruler. Depending on the rulers you use the numbers may be in centimeters instead of millimeters.

Materials:
-color copies fish photographs, cut out and laminated
-rulers that measure to millimeters, a few meter sticks for larger fish
-copies of station map, data chart and species ID guide for each group
-copies of graph for each student
-paper copies or computers for online version of Gulf of Mexico Data Atlas

Technical Requirements:
-Computer with internet access to use the Gulf of Mexico Data Atlas. This could be one computer projected for the class to see, a few computers that groups use, or a computer lab. Alternatively the teacher could print and copy relevant maps.

Teacher Preparation:
-Preparing fish samples. Print out fish pictures in color. Cut them out and laminate them. Arrange fish into 8 stations using bags or bins to hold each sample.
-Split class into 8 groups
- Copy maps, ID guide and graph paper

Keywords:
trawl
sample
dissolved oxygen
hypoxia

Lesson Procedure:

Day 1

1) Introduce NOAA Teacher at Sea experience with photos and maps of cruise. Explain that the class will be modeling the scientific research done on board right here in the classroom.
2) Divide class into 8 groups. Hand out map and ID guide to each group.
3) Examine the resources
    a. Look at the map of the 8 fish lab stations. Compare it to the actual trip (300 + species at 130+ trawl stations).
    b. Look at species identification guide. Groups discuss physical characteristics of species. Take notes and label key differences in ID guide.
        i. Difference between brown and rock shrimp.
        ii. Difference between porgy and butterfish
        iii. Difference between goatfish and snapper
    c. model how to use the data chart
4) Group roles
    a. Deck Hand – gets "net" and returns materials when done
    b. Watch Leader – records the measurements on the data chart
    c. Field Party Chief – keeps the team on task and reports findings to class
5) Groups work on their station.
    a. Deck Hand gets the materials
    b. Group sorts paper fish into species and counts the number of individuals in each species. The Watch Leader records this information.
    c. Group measures the first 4 individuals in each species to the nearest millimeter. The Watch Leader records this information.
        i. For all fish species measure the fork length (from the head to the fork in the tail)

ii. For shrimp measure the whole length. On the boat we would flatten the shrimp out so they laid flat on the measuring board. With the paper shrimp you will need to rotate the ruler while measuring.
iii. For scallops and crabs measure across the widest part of the shell (but not the legs on the crab)

6) Summarize the day's findings. Field Party Chief from each group shares with the class the largest individual they found and which species was the most common.
7) Deck Hand returns materials.

Day 2

1) Review what you did on day 1. Discuss how students could show their data and why a bar graph is a good way to represent amounts in various categories.
2) Each person makes a bar graph of their station (# of individuals in each species).
3) Display one graph from each group so students can compare among stations. It may be better to put out three sets of the graphs so everyone can see. Ask questions about the graphs:
    a) Which station has the most total individuals? The least?
    b) Which station has the most shrimp? The least?
    c) Which stations have the most red snapper? Do you remember from yesterday where the biggest red snapper was found?
    d) Is there a station with few fish, but a lot of shellfish?
4) Ask students to think of reasons why the fish populations are different in the various stations. Record a few ideas on chart paper. Have students brainstorm in their groups to come up with more ideas. Record more ideas on the chart paper. Keep this list for the next day.

Day 3

1) Post the chart paper and graphs from Day 2.

2) Tell students that sometimes on the groundfish survey there wouldn't be any other boats visible. Other times you could see several shrimp trawlers nearby. Which station do they think would be near other shrimp boats?

3) Review ideas about factors that influence marine species. Project the NOAA Gulf of Mexico Data Atlas website and demonstrate how to navigate the site.

a. Using the world imagery map as the basemap, ask why they think the color of the ocean changes. Then click on the general bathymetry map overlay. Discuss the contour lines. Show how to minimize the basemap control panel.
b. Under the physical tab, show the seawater temperature – climatological mean map. Show how the title of the map tells you what is being mapped. Show the information bar on the right side. Within

the description section they can click on the red text to change seasons and depth. As they do this the title will change to show what is currently being mapped. Farther down on the right is the legend.

4) Groups explore the Gulf of Mexico Data Atlas. They will be estimating the location of the trawl sites using the station map. Remind them that the survey was done during the summer season as several maps have season options. Also remind students that the trawls bring up species that live on the bottom.

a. What information can they learn about their station? Encourage them to use these maps on the physical tab: Seawater Temperature, Dissolved Oxygen-Hypoxia, Marine Geology. They may find interesting information from the other options as well.
b. What information can they find out about the different species in our stations? The Living Marine Resources tab has maps by species –relative abundance map is the most useful. Maps are available for red snapper, brown shrimp and gulf butterfish.

5) Bring the groups together to share information they gathered. Discuss why the populations of fish vary throughout the gulf.

Questions for the class:

Which stations have the deepest water? The shallowest water?

Is the bottom surface the same for all stations? How might that influence which species live in that place?

Which station is in the hypoxia zone? How was the sample at that station different from the other ones?

Assessment and Evaluation:

-Use observations as students are working and the completed data chart to check if they successfully sorted the sample by species and made reasonable measurements.

-Use the completed graph to assess their ability to represent the data.

Standards:

National Science Education Standard(s) Addressed:

Disciplinary Core Ideas

LS4.C: Adaptation

- For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all.

LS4.D: Biodiversity and Humans

- Populations live in a variety of habitats, and change in those habitats affects the organisms living there.

Science and Engineering Principals

Practice 3: Planning and Carrying Out Investigations

Practice 4 Analyzing and Interpreting Data

Ocean Literacy Principles Addressed:

5: The ocean supports a great diversity of life and ecosystems.

6: The oceans and humans are inextricably interconnected

State Science Standard(s) Addressed:

Massachusetts

5.LS.1 Classify plants and animals according to the physical characteristics that they share

Additional Resources:

Gulf of Mexico Data Atlas http://www.ncddc.noaa.gov/website/DataAtlas/atlas.htm

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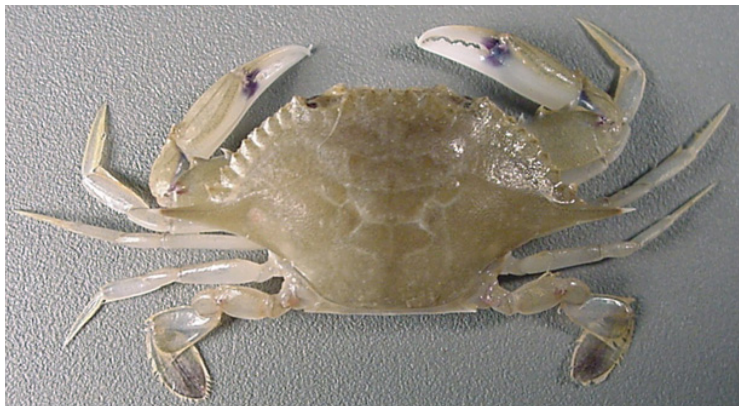
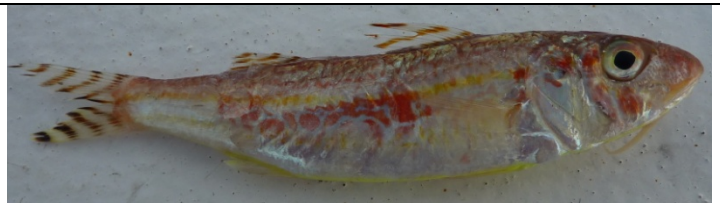
Species Identification Guide

Brown Shrimp  *Farfantepenaeus aztecus*	**Rock Shrimp**  *Sicyonia brevirostris*
Lesser Blue Crab  *Callinectes similis*	**Paper Scallop**  *Amusium papyraceum*
Dwarf Goatfish	**Longspine Porgy**



Upeneus Parvus

Stenotomus caprinus

Red Snapper

Lutjanus campechanus

Gulf Butterfish

Peprilus burti

Images: brown shrimp, rock shrimp and red snapper from NOAA FishWatch. Photos by Sarah Boehm

Groundfish Survey of the Gulf of Mexico

Data Chart Station _____

Species	Count	Length (mm) for the first 4 individuals of each species in your sample			
Brown Shrimp					
Rock Shrimp					
Paper Scallop					
Lesser Blue Crab					
Dwarf Goatfish					
Red Snapper					
Gulf Butterfish					
Longspine Porgy					

Groundfish Survey of the Gulf of Mexico

Species Abundance at Station _____

Number of individuals in sample

Brown Shrimp	**Rock Shrimp**	**Paper Scallop**	**Lesser Blue Crab**	**Dwarf Goatfish**	**Red Snapper**	**Gulf Butterfish**	**Longspine Porgy**

Species


United States of America
Mobile
Pensacola
Pascagoula
New Orleans
Galveston
1
2
3
4
5
6
7
8
Florida
Gulf of Mexico
Cuba
Yucatán
Jamaica

Station Map

Distribution of Species for Station “Nets”

Station	**Brown Shrimp**	**Rock Shrimp**	**Paper Scallop**	**Lesser Blue Crab**	**Dwarf Goatfish**	**Red Snapper**	**Gulf Butterfish**	**Longspine Porgy**
1	1	0	2	0	0	3	4	1
2	0	0	0	0	2	1	2	1
3	1	0	10	0	1	0	4	5
4	7	4	3	0	2	1	2	0
5	0	0	4	3	0	0	1	0
6	0	2	7	5	0	0	0	2
7	5	5	0	1	1	0	2	0
8	3	2	1	2	2	0	0	1